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Critical Literature Review

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Have Southern Ocean whale populations recovered from the intense whaling of the last century and what is the future of these populations?

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Abstract

In 1904 shore based whaling moved to the Antarctic region and in 1925 factory ships began harvesting the open oceans. The International Whaling Commission (IWC) was set up in 1946 by which time southern right whales and humpbacks in the Southern Ocean were commercially extinct. Quotas and management practices were set in place but catches increased until 1962 when populations crashed. It wasn't until 1986, that a full moratorium on commercial whaling took place but there was a loop hole to allow scientific whaling. DNA sampling from whale meats from Japanese markets in the early 1990's showed that the Japanese had been illegally harvesting humpback whales. Records obtained after the fall of the Soviet Union showed they had been undertaking extensive illegal whaling. In recent years, key whale species taken in the Southern Ocean have shown signs of recovery but this varies greatly with blue whales still considered highly endangered. The IWC was not effective with the management of the initial whale stocks and now they are faced with a polarised view amongst members with no areas of compromise. Fundamental issues on how we feed the growing human population are discussed but require further research.

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Introduction

This review summarises the history of whaling in the Southern Oceans. It details four key species: blue, humpback, southern right and minke whales, and the effects whaling has had on them. Population estimates are given for pre-whaling, start of moratorium (1986) and present (2013). The International Whaling Commission (IWC) and the complex issues it now faces, including whether or not whales should be harvested as a sustainable resource, are discussed.

History of Whaling

Evidence of whaling 4,000 to 5,000 years ago has been found in carvings in Norse Stone Age villages and in Eskimo middens of Alaska. The impacts of this type of whaling, like aboriginal subsistence whaling of today, was small as the tools for whaling were basic – hand held harpoons and either open boats or kayaks. It wasn't until the 1600's when the Dutch, British, Germans and French started whaling, did some whale populations start to decline. Whale oil was in demand for lamps and whalebone for umbrellas, whips and corsets (Evans 1987).

A major advancement in whaling occurred in 1868 when Norwegian, Svend Foyn developed an explosive grenade harpoon. It was designed to be fired from a cannon mounted on the bow of the vessel. The harpoon was attached to a line so that whales could be quickly secured (Harrison 1988). Around this time, faster and more manoeuvrable steam vessels were used, enabling whalers to pursue the faster rorquals (blue, fin and sei whales). The use of compressors to pump air into a carcass greatly reduced the loss of whales from sinking (Clapham and Baker 2002). Whaling had become highly efficient.

In 1904, Antarctic whaling began in the most biologically productive seas of the world. Shore-based whaling by the Norwegians started at South Georgia and the South Shetlands and shortly after on Deception Island on the Antarctic Peninsula (Evans 1987). In 1925, factory ships that could process whales on board began harvesting across the entire Southern Ocean. During the 1937-8 season, 46,000 whales were taken in the region. In ten years, 18,557 humpbacks had been killed and the population was considered commercially extinct. The blue whale stock didn't fare any better with 39,296 killed up until 1936 (Clapham and Baker 2002).

It was initially Norway that pushed for control of whaling, and in 1931 the Convention for the Regulation of Whaling was held. In 1935 worldwide protection for right whales was given, and two years later grey whales were added. Neither Japan nor the Soviet Union had ratified these agreements, and so were free to target these species. Whaling nations agreed to voluntarily limit the amount of oil produced from catching whales to 2.5 million barrels per year (Evans 1987). The Blue Whale Unit (BWU) was established where the oil from 1 blue whale was equivalent to that of 2 fin, 2.5 humpbacks or 6 sei whales. Though it limited the overall catch take, this was disastrous for the blue whale. Minimum catch lengths for blue and fin whales, and opening and closing dates for the season followed (Evans 1987).

During World War Two virtually all whaling ceased, then in 1946, the International Convention for Regulation of Whaling was signed by all whaling nations. This Convention created the International

Whaling Commission (IWC), whose purpose was to study whale stocks to regulate whaling, and to set quotas to allow Maximum Sustainable Yield (Clapham and Baker 2002).

At IWC's first meeting in 1949, the total ban on humpbacks was removed and a quota of 1250 given. The scientific committee's attempts to reduce quotas were generally unsuccessful and catches continued to increase, reaching a peak in 1960-1 at 16,433 BWU. After 1962, Antarctic whaling catches drastically declined as populations crashed. In the next 10 years several of the whaling nations pulled out of the Antarctic and in 1972 the IWC finally abandoned the BWU system. A ban was placed on blue and humpback whaling and separate quotas were given for fin, sei, minke and sperm whales (Evans 1987).

The makeup of the IWC slowly shifted with non-whaling nations joining, and giving a greater voice for conservation. A moratorium on all whaling was initially proposed by the United States and Mexico in 1974, but it wasn't until 1986 that it actually came into effect. Japan, Norway and the Soviet Union filed objections to the moratorium. Shortly after, the United States persuaded Japan to withdraw their objection by threatening to deny access to their rich pollock fishing grounds off Alaska. While the Soviet Union have not begun whaling again, Norway began limited whaling in 1993 (Knauss 1997).

There are two exceptions under the moratorium under which whaling is allowed. One is aboriginal subsistence whaling for ethnic groups, such as the Eskimos living in the Arctic. The other is research whaling, which allows the killing of whales for scientific purposes. Japan has made the most of this loophole with kills of 300-400 minke whales per year since 1987 (Knauss 1997).

In 1994, the IWC created the Southern Ocean Whale Sanctuary to allow depleted species to recover. Over the previous 70 years, approximately 2 million whales were killed in the Antarctic grounds - a staggering 750,000 of these were fin whales (Clapham and Baker 2002). No commercial whaling is allowed within the sanctuary, even if the worldwide moratorium on whaling is lifted. Japan objected to having minke whales on the list of protected species within the sanctuary, and is therefore not bound by the Commission's decision to establish the sanctuary.

New Zealand and Australia have proposed a South Pacific Whale Sanctuary that, together with the Southern Ocean Whale Sanctuary, would protect Southern Hemisphere whales during their entire life cycles. This did not achieve the three quarter majority vote to have it passed at the IWC (DoC 2004).

Status of Southern Hemisphere Whale Populations

The Southern Ocean is one of the most biologically productive regions of the world due to ocean currents causing upwelling of cold, nutrient rich waters which support an abundance of phytoplankton, zooplankton, krill and the fish, penguins, seals and whales that feed on it and each other. Many whale populations of the Southern Hemisphere take advantage of this food source by migrating down to these productive waters to feed in the summer.

Population estimates for four key whale species of the Southern Hemisphere population are given in Table 1. The estimates are sourced from the IWC website (http://iwc.int/estimate, 5th December 2013). Pre-whaling estimates were calculated by obtaining the total whale catch data from ship and

whaling station logs and adding this to current abundance estimates obtained from capture-recapture analysis. Corrections are made for natural mortality and reproduction (Baker and Clapham 2004).

Table 1. Southern Hemisphere population estimates of four key whale species for pre-whaling, 1986 (time of moratorium) and 2013 (present).

	Pre-whaling	1986	2013
Blue	220,000	11,000	2,300
Humpback	100,000	3,000	42,000
Southern right	100,000	3,000	12,000
Minke	436,000	380,000	515,000

Blue whales *Balaenoptera musculus*

Female blue whales grow up to 30 metres long and weigh up to 170 tonnes. They are the largest animal to ever live on this planet; their heart weighs as much as a small car (Barns and Creagh 1988). A sub species, known as the pygmy blue (*Balaenoptera musculus brevicauda)*, found in the Southern Hemisphere has been described (Ichihara 1966). Blue whales in the Southern Hemisphere feed almost entirely on krill making them particularly susceptible to over exploitation of this resource (Clapham *et al.* 1999). In the 2010/2011 fishing season, 150,000 tonnes of krill were caught in the Southern Ocean, mainly by Russia and Ukraine, but in some years it has been as much as 500,000 tonnes (Miller 2014). Krill are not often used for human food, but are used to make feed for farmed fish and nutritional omega 3 supplements.

In Antarctic waters 360,000 blue whales have been harvested (IWC 1995). The wide ranging behaviour and inaccessibility of the Blue Whales in the Southern Ocean has made research difficult. This explains why the 1986 estimate of 11,000 was later reduced to 2,300 (Table 1.). Annual whale counts in the Cook Strait of New Zealand by the Department of Conservation have recorded the presence of blue whales but overall their numbers are small and they remain highly endangered (Clapham and Baker 2002). In recent years, there is some evidence of an increase of around 8% per year (IWC website).

Humpback Whales *Megaptera novaeangliae*

The Humpback whale is one of the best known of the baleen whales species as it is the basis of whale tourism throughout the world, including Australia and Tonga. They grow up to 15 metres, weigh 65 tonnes, and are well known for their huge pectoral fins (*Megaptera* means great wing). Their bubble net feeding behaviour, to catch fish, has been widely documented, as has their singing. Humpbacks have been the focus of several long-term studies because they are easily identified by their natural markings (Evans 1987).

In the twentieth century, an estimated 210,000 humpback whales were killed in the Southern Hemisphere. The population that passed by New Zealand on their migratory routes crashed in 1960

as a result of shore-based whaling, and of the Soviet catch of 13,000 humpback whales in the southern feeding grounds between 1956-1960 (Clapham and Baker 2002).

Most of the humpback populations of the Southern Hemisphere have recovered extremely well, after protection given to them by the IWC in 1963 (Clapham *et al.* 1999, Gales *et al.* 2011). The West Australian "Stock D" population was estimated to be at 70-80% of pre-exploitation levels (Gales *et al.* 2011). In 2012, the Cook Strait whale count recorded 106 humpback whale sightings in a four week survey period. This was up on the 73 whales counted in the previous year (DoC 2012).

Humpback whale tourism in Tonga was encouraged by New Zealand after concerns that Japan was trying to encourage Tonga to resume aboriginal whaling (M. Donoghue, pers. comm.). Subsistence whaling had occurred there until 1978. Swimming with the whales is now an established industry, though there are issues about harassment of whales during this vulnerable calving time. It is ironic that it is illegal to swim with whales in New Zealand, even though they are the same humpbacks that migrate from Tonga.

Southern right whale *Eubalaena australis*

Southern right whales grow up to 18 metres, weigh 60 tonnes, and feed mainly on copepods and krill (Barns and Creagh 1988). The right whale was named because it was the "right whale to hunt"- it was coastal, very slow moving and one of the few whale species that remained afloat even when dead.

An estimated 60,000 southern right whales were killed by American whalers during the 19th century. This led to them becoming commercially extinct and in 1935, they became the first whale to be fully protected. In recent times, they have been studied extensively throughout Western Australia, eastern South America and South Africa where all populations have shown annual rates of increase of 6- 14% (Clapham *et al.* 1999).

In New Zealand, a significant population of southern right whales now visits the northern end of the Sub Antarctic Auckland Islands to calve and mate. Up to 165 whales were found in Port Ross and Laurie Harbour during one day in winter. A photographic catalogue, and capture –recapture analysis, indicate a population of between 740 and 1140 whales (Patenaude 2000).

Southern right whales were not seen around mainland New Zealand from 1928 to 1963 even though there were once breeding grounds in Wellington Harbour (Gaskin 1964). The population has been very slow to recover, with an estimate of less than a dozen reproductive females visiting in 2002 (Patenaude 2003).

Significant genetic differentiation has been found between Western Australian and Auckland Island populations (Baker *et al.* 1999), which indicated little movement between these two populations and possible inbreeding.

Minke whale *Balaenoptera acutorostrata*

Minke whales grow up to 11 metres, and weigh up to 10 tonnes. They were not initially targeted by the early whalers as they are the smallest of the rorquals. Populations are thought to have increased due to the exploitation of the larger baleen whales, and a consequent reduced competition for krill

(Best 1987). They are presently the most common of the Southern Ocean great whales, with an estimated population of 515,000 whales (Table 1.). They have been described as being “currently abundant in much of their range” (Clapham and Baker 2002, p1331).

Japanese whaling interests claim that by reducing the minke whale population, they will assist the recovery of the blue and fin whale populations (IWC 1994). Clapham and Brownell (1996) argue there is little basis that this is happening and that blue whales have considerably more reserves than minke whales and so are able to survive greater variation in krill abundance.

The Effectiveness of the IWC

There have been obvious problems with the management of whale populations by the IWC. From records obtained after the fall of the Soviet Union in 1991, it was revealed that the Soviets had under reported their catches by 75,000 whales for the period 1947 to 1972. (Yablokov 1994). No wonder they had resisted initiatives by the IWC to have independent observers on ships.

In 1993, fully protected fin and humpback whale meat was detected in Japanese markets using DNA sequencing techniques (Baker and Palumbi 1994). In 1996 minke whale meat, originating from Norway was impounded in Japan and in 2007, three species of whale meat were found in restaurants in Los Angeles and Seoul, with DNA matches to products purchased in Japan (Baker *et al.* 2010). These species are listed by the Convention on International Trade in Endangered Species and therefore cannot be legally traded for commercial use.

More stringent policing is required by the IWC. If any future whaling were to occur, Baker and Palumbi (1994) believe genetic testing of commercial meat should be a requirement under IWC regulations. This would allow whale meat to be traced from source to consumer.

Clapham *et al.* (2007) believe that the whaling industry cannot be trusted to regulate itself or assess the status of the potentially harvestable populations. However, it is better to reach an agreement with the pro-whaling nations within the IWC, rather than drive them out and have them whaling beyond the control of the commission (Whittington 2013).

Japan has actively recruited over 19 states, more than 50% from West Africa, into the IWC in exchange for aid and payment of IWC fees. After Nicaragua supported Japan in every issue at the 2004 IWC meeting, Japan cancelled a US$118 million debt (3rd Millennium Foundation n.d.). According to the Japan Whaling Association, they are “paving the way into broader participation of countries interested in sustainable use of wildlife resources” (3rd Millennium Foundation n.d. p 3). This activity of vote buying by Japan (and most likely also by other IWC nations), questions the credibility of IWC and needs attention.

Discussion

To address the future of the IWC we first need to look at the underlying issues between the anti-whaling and pro-whaling nations that have polarised the IWC. Clearly the whale populations of the Southern Oceans have started to recover and some are now even abundant. Clapham *et al.* (1999, p 41) note that “fin, sei, minke and bryde’s whales are thought to be abundant throughout much or all

of their ranges". The argument against whaling because whale populations are endangered only applies to those species that are (e.g. blue and right whales). But anti-whaling nations and Non Government Organisations (NGO) such as Greenpeace, believe all whales should be fully protected even if populations have recovered. Their arguments revolve around the 'fubsy factor' of whales - big, beautiful and intelligent, and are not based on scientific facts on whether whale populations can maintain a sustainable catch.

Conservation activism by NGO's is having an impact. The record low catch of minke whales in 2013 (only 103) was attributed to Sea Shepherd's successful harassment, which distracted the fleet from hunting for 21 days culminating in a collision between vessels (Torres 2013). The 'Saving the Whale' campaign has spearheaded a world-wide environmental movement and remains a significant fundraising tool for Greenpeace and Sea Shepherd (Goodman 2011).

An opposing view comes from Kristjan Loftsson, Iceland's whaling king, who believes whales are just like another fish. He thinks the most vocal anti-whaling nations are those with a guilty conscience – those that want Iceland to stop whaling are the countries responsible for killing 64,000 blues and 105,000 fins in the Southern Ocean (Chaon 2010).

John Knauss, who served as the U.S. Commissioner to the IWC, believes that most members of the IWC are philosophically opposed to whaling, even though the IWC has a conservative management plan for limited harvesting of some populations. By not making compromises, Knauss believes, the anti-whaling nations are putting the whole of the IWC and the whale populations of the world in jeopardy. He suggests that by allowing limited whaling, the IWC is more likely to have agreement for future whale sanctuaries, and the IWC could also broaden its schedule to include small whales and dolphins. He suggested a compromise of allowing coastal states to hunt whales in their Exclusive Economic Zones by their own citizens and only for food consumed in their own country (Knauss 1997). Goodman (2011, p 64) came to a similar conclusion, after noting the bi-polar and conflictive nature at the IWC meeting in 2007. "Negotiations failed to produce a successful outcome because anti-whaling members of the organisation, whose positions are being driven by the anti-whaling NGOs, chose not to offer meaningful compromises".

In the last 30 years, whale tourism has created economic benefit for many small seaside towns. Whale watching is estimated to be a US$2 billion a year industry, employing over 13,000 workers. Thirteen million people went whale watching in 2008 (O'Conner 2009). In comparison the present trade in whale meat by Japan is estimated at only US$50 million (Gales *et al.* 2005). So whales may be more profitable if not caught, or can we carefully manage the populations so we can have both whale watching and whaling.

At the present time there is five thousand tonnes of whale meat sitting in freezers around Japan as younger generations rarely consume whale meat and prefer hamburgers. The Japan's Institute for Cetacean Research has had to start an advertising campaign, to promote whale meat, as a nutritious food that increases strength and reduces fatigue (Lavina 2013). How much can this change in behaviour be attributed to propaganda from NGO's that may be flawed in the first place? Sustainably harvested whales may be a more environmental and ethical source of meat than beef derived from clear felling of native rainforest or factory farms.

Conclusion

The IWC has been largely ineffective in managing whale stocks in the past, but this doesn't mean it cannot be effective in this role in the future. Modern technology and DNA sampling techniques have the potential to greatly assist the IWC to monitor and control any renewed whaling. Presently the IWC is awaiting a significant court case in which Australia took Japan to the International Court of Justice over the legality of its scientific whaling practices. The outcome of this case, due in early 2014 could be a pivotal moment in the history of the IWC (Whittington 2013).

The issue however is more on whether it is good practice to sustainably use natural wildlife resources such as whales or fish. We do need to find ways to feed the world's increasing human population and there is no doubt that the Antarctic oceans are a very productive region of the world and a great potential source of protein. Perhaps it would be better to eat free range whale meat than factory farmed pork? The future of the whale populations of the Southern Oceans and whether or not to allow some sustainable harvest revolves around this issue and requires more debate and research.

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